

Notice of Allowability	Application No.	Applicant(s)	
	10/043,127	ABE, NOBUAKI	
	Examiner	Art Unit	
	Tuan V Ho	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to ____.
2. ☒ The allowed claim(s) is/are 1-25.
3. ☒ The drawings filed on 1/4/2002 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date ____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date ____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other ____. |

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1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Piepz on 1/6/2005.

The application has been amended as follows:

P21595.Claims

(CURRENTLY AMENDED)

1. An image interpolating device comprising:

h

a color filter having a first row, in which red (R) and green (G) color filter elements are alternately aligned in the horizontal direction, and a
5 second row, in which G and blue (B) color filter elements are alternately aligned in the horizontal direction, said second row being adjacent to the upper or lower side of said first row;

an imaging device that generates first R, G, and B-signals which are pixel signals corresponding to said color filter elements;

10 a pattern-setting processor that extracts images belonging to a first pattern, in which a pixel having said first R-signal is positioned at the upper-left corner of a 2 x 2 pixel matrix, a second pattern, in which a pixel having said first G-signal is positioned at the upper-right corner of said 2 x 2 pixel matrix, a third pattern, in which a pixel having said first G-signal is
15 positioned at the lower-left corner of said 2 x 2 pixel matrix, and a fourth pattern, in which a pixel having said first B-signal is positioned at the lower-right corner of said 2 x 2 pixel matrix, from said first R, G, and B-signals generated by said imaging device;

a G-interpolation processor that, regarding first and fourth objective
20 pixels contained in said images belonging to said first and fourth patterns, obtains a second G-signal by utilizing said first G-signals of pixels adjacent to said first or fourth objective pixel;

an R/B-interpolation processor that, regarding second and third

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objective pixels contained in said images belonging to said second and third patterns, obtains second R and B-signals by utilizing said first R and B-signals of pixels adjacent to said second and third objective pixels;

a B-interpolation processor that extracts a first similar pixel which
5 has the closest luminance value to that of said first objective pixel, from pixels adjacent to said first objective pixel, and obtains a third B-signal based on first information of said first similar pixel; and

an R-interpolation processor that extracts a second similar pixel which has the closest luminance value to that of said fourth objective pixel,
10 from pixels adjacent to said fourth objective pixel, and obtains a third R-signal based on second information of said second similar pixel.

(ORIGINAL)
2. A device according to claim 1, wherein said first information
^ comprises a luminance value and a color difference signal Cb of said first similar pixel, and said second information comprises a luminance value
15 and a color difference signal Cr of said second similar pixel.

(ORIGINAL)
3. A device according to claim 1, wherein said first information
^ comprises color difference signals Cb and Cr, and said second information comprises color difference signals Cb and Cr.

(ORIGINAL)
4. A device according to claim 1, wherein said pixels, which are
^ adjacent to said first and fourth objective pixels and which are utilized in
20 said G-interpolation processor, are contained in said images belonging to said second and third patterns.

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(ORIGINAL)

5. A device according to claim 1, wherein said pixels, which are adjacent to said second and third objective pixels and which are utilized in said R/B-interpolation processor, are contained in said images belonging to said first and fourth patterns.

(CURRENTLY AMENDED)

6. A device according to claim 1, wherein said pixels, which are adjacent to said first and fourth objective pixels and which are utilized in both said B-interpolation processor and said R-interpolation processor, are contained in said images belonging to said second and third patterns.

(CURRENTLY AMENDED)

7. A device according to claim 1, wherein said B-interpolation processor and said R-interpolation processor respectively extract said first and second similar pixels, using said first G-signals of said pixels adjacent to said first and fourth objective pixels.

(CURRENTLY AMENDED)

8. A device according to claim 2, wherein said B-interpolation processor obtains said third B-signal, on the assumption that said color difference signal Cb of said first objective pixel is equal to said color difference signal Cb of said first similar pixel.

(CURRENTLY AMENDED)

9. A device according to claim 2, wherein said R-interpolation processor obtains said third R-signal, on the assumption that said color difference signal Cr of said fourth objective pixel is equal to said color difference signal Cr of said second similar pixel.

(CURRENTLY AMENDED)

10. A device according to claim 2, wherein said B-interpolation processor obtains said third B-signal, using said color difference signal Cb and a modified luminance value which is obtained by multiplying said

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luminance value by a ratio of said second G-signal of said first objective pixel and said first G-signal of said first similar pixel.

(CURRENTLY AMENDED)

11. A device according to claim 10, wherein said B-interpolation processor obtains said third B-signal, according to the following formula.

$$Y=0.299 \times R(x',y')+0.587 \times G(x',y')+0.114 \times B(x',y')$$

$$Cb=-0.169 \times R(x',y')-0.331 \times G(x',y')+0.5 \times B(x',y')$$

$$YG=Y \times G(x,y)/G(x',y')$$

$$b=YG+1.772 \times Cb$$

wherein Y is a luminance value of said first similar pixel, $R(x',y')$, $G(x',y')$, and $B(x',y')$ are said second R, first G, and second B-signals of said first similar pixel, $G(x,y)$ is said second G-signal of said first objective pixel, b is said third B-signal obtained by said B-interpolation processor, and YG is said modified luminance value.

(CURRENTLY AMENDED)

12. A device according to claim 2, wherein said R-interpolation processor obtains said third R-signal, using said color difference signal Cr and a modified luminance value which is obtained by multiplying said luminance value by a ratio of said second G-signal of said fourth objective pixel and said first G-signal of said second similar pixel.

(CURRENTLY AMENDED)

13. A device according to claim 12, wherein said R-interpolation processor obtains said third R-signal, according to the following formula.

$$Y=0.299 \times R(x',y')+0.587 \times G(x',y')+0.114 \times B(x',y')$$

$$Cr=0.5 \times R(x',y')-0.419 \times G(x',y')-0.081 \times B(x',y')$$

$$YG=Y \times G(x,y)/G(x',y')$$

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$$r=YG+1.402 \times Cr$$

wherein Y is a luminance value of said second similar pixel, $R(x',y')$, $G(x',y')$, and $B(x',y')$ are said second R, first G, and second B-signals of said second similar pixel, $G(x,y)$ is said second G-signal of said fourth objective pixel, r is said third R-signal obtained by said R-interpolation processor, and YG is said modified luminance value.

(CURRENTLY AMENDED)

14. A device according to claim 1, wherein said B-interpolation processor extracts said first similar pixel, using said first G-signal and said second R-signal of said pixels adjacent to said first objective pixel.

(CURRENTLY AMENDED)

10 15. A device according to claim 1, wherein said R-interpolation processor extracts said second similar pixel, using said first G-signal and said second B-signal of said pixels adjacent to said fourth objective pixel.

(CURRENTLY AMENDED)

16. A device according to claim 2, wherein said B-interpolation processor obtains said third B-signal, using said color difference signal C_b and a modified luminance value which is obtained by multiplying said luminance value by a ratio of a first reference value, which is obtained based on said second G-signal and said first R-signal of said first objective pixel, and a second reference value, which is obtained based on said first G-signal and second R-signal of said first similar pixel.

(CURRENTLY AMENDED)

20 17. A device according to claim 16, wherein said B-interpolation processor obtains said third B-signal, according to the following formula.

$$Y=0.299 \times R(x',y')+0.587 \times G(x',y')+0.114 \times B(x',y')$$

$$C_b=-0.169 \times R(x',y')-0.331 \times G(x',y')+0.5 \times B(x',y')$$

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$$YG=Y \times$$

$$(0.587 \times G(x,y)+0.299 \times R(x,y))/(0.587 \times G(x',y')+0.299 \times R(x',y'))$$

$$b=YG+1.772 \times Cb$$

wherein Y is a luminance value of said first similar pixel, $R(x',y')$, $G(x',y')$,

- 5 and $B(x',y')$ are said second R, first G, and second B-signals of said first similar pixel, $G(x,y)$ is said second G-signal of said first objective pixel, b is said third B-signal obtained by said B-interpolation processor, and YG is said modified luminance value.

(CURRENTLY AMENDED)

18. A device according to claim 2, wherein said R-interpolation
 10 processor obtains said third R-signal, using said color difference signal Cr and a modified luminance value which is obtained by multiplying said luminance value by a ratio of a first reference value, which is obtained based on said second G-signal and said first B-signal of said fourth objective pixel, and a second reference value, which is obtained based on
 15 said first G-signal and said second B-signal of said second similar pixel.

(CURRENTLY AMENDED)

19. A device according to claim 18, wherein said R-interpolation
 processor obtains said third R-signal, according to the following formula.

$$Y=0.299 \times R(x',y')+0.587 \times G(x',y')+0.114 \times B(x',y')$$

$$Cr=0.5 \times R(x',y')-0.419 \times G(x',y')-0.081 \times B(x',y')$$

20 $YG=Y \times$

$$(0.587 \times G(x,y)+0.114 \times B(x,y))/(0.587 \times G(x',y')+0.114 \times B(x',y'))$$

$$r=YG+1.402 \times Cr$$

wherein Y is a luminance value of said second similar pixel, $R(x',y')$,

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$G(x',y')$, and $B(x',y')$ are said second R, first G, and second B-signals of said second similar pixel, $G(x,y)$ is said second G-signal of said fourth objective pixel, r is said third R-signal obtained by said R-interpolation processor, and YG is said modified luminance value.

(CURRENTLY AMENDED)

- 5 20. A device according to claim 3, wherein said B-interpolation processor obtains said third B-signal, on the assumption that said color difference signals C_b and C_r of said first objective pixel are equal to said color difference signals C_b and C_r of said first similar pixel.

(CURRENTLY AMENDED)

21. A device according to claim 3, wherein said R-interpolation processor obtains said third R-signal, on the assumption that said color difference signals C_b and C_r of said fourth objective pixel are equal to said color difference signals C_b and C_r of said second similar pixel.

(CURRENTLY AMENDED)

22. A device according to claim 3, wherein said B-interpolation processor obtains said third B-signal, using said first R-signal of said first objective pixel and said color difference signals C_b and C_r of said first similar pixel.

(CURRENTLY AMENDED)

23. A device according to claim 22, wherein said B-interpolation processor obtains said third B-signal, according to the following formula.

$$C_b = -0.169 \times R(x',y') - 0.331 \times G(x',y') + 0.5 \times B(x',y')$$

20 $C_r = 0.5 \times R(x',y') - 0.419 \times G(x',y') - 0.081 \times B(x',y')$

$$b = 1.293 \times R(x,y) + 2.293 \times C_b - 1.812 \times C_r$$

wherein $R(x',y')$, $G(x',y')$, and $B(x',y')$ are said second R, first G, and second B-signals of said first similar pixel, $R(x,y)$ is said first R-signal of said first

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objective pixel, and b is said third B-signal obtained by said B-interpolation processor.

(CURRENTLY AMENDED)

24. A device according to claim 3, wherein said R-interpolation processor obtains said third R-signal, using said first B-signal of said

5 fourth objective pixel and said color difference signals Cb and Cr of said second similar pixel.

(CURRENTLY AMENDED)

25. A device according to claim 24, wherein said R-interpolation processor obtains said third R-signal, according to the following formula.

$$Cb = -0.169 \times R(x', y') - 0.331 \times G(x', y') + 0.5 \times B(x', y')$$

10 $Cr = 0.5 \times R(x', y') - 0.419 \times G(x', y') - 0.081 \times B(x', y')$

$$r = 0.773 \times B(x, y) - 1.773 \times Cb + 1.401 \times Cr$$

wherein $R(x', y')$, $G(x', y')$, and $B(x', y')$ are said second R, first G, and second B-signals of said second similar pixel, $B(x, y)$ is said first B-signal of said fourth objective pixel, r is said third R-signal obtained by said R-

15 interpolation processor.

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2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUAN HO whose telephone number is (703) 305-4943. The examiner can normally be reached on Mon-Fri from 7AM to 4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's acting supervisor, Thai Tran can be reached on (703) 305-4725. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.



TUAN HO

Primary Examiner

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